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July 23, 2019

Elias Quinn
Trial Attorney
U.S. Department of Justice
March 21, 2019
Environment and Natural Resources Division
P.O. Box 7611
Washington, DC 20044-7611

Re: Design Specifications for Birla Carbon's North Bend NOx Control System

Dear Eli:

In accordance with the requirement of Section VII of the Consent Decree executed by Birla Carbon, the United States, and the State of Louisiana and entered by the U.S. District Court for the Western District of Louisiana in matter 6:17-cv-01661-RGJ-CBW on June 11, 2018, Birla Carbon is transmitting for EPA' s review the design specifications for the North Bend Plant's Low NOx Combustion System. The attached design specifications demonstrate that the technology is consistent with the NOx Process Systems Operation Emissions Limits, and Control Technology requirements established in the Consent Decree. Please feel free to contact us if you wish to discuss the details of this submission.

Sincerely,

David Buente

cc: Kellie Ortega, U.S. EPA
Stacey Dwyer, U.S. EPA Region 6 (by overnight mail and email)
Lisa Gotto, U.S. EPA Region 7 (by overnight mail and email)
Chief, Air Permitting and Compliance Branch, U.S. EPA Region 7 (by overnight mail)
Alex Chen, U.S. EPA Region 7 (by overnight mail and email)
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Birla Carbon

Design Specifications For
Birla Carbon's
North Bend NOx & SO_2 Control System

July 17, 2019

BIRLA CARBON
DESIGN SPECIFICATIONS
FOR BIRLA CARBON'S NORTH BEND PLANT PROCESS SYSTEMS
NO_X and SO_2 EMISSIONS CONTROL SYSTEM

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1.0 INTRODUCTION

In satisfaction of the Civil Action No. 17-1661 Consent Decree (the "Consent Decree"), executed between Birla Carbon, the United States and the State of Louisiana, Birla Carbon is hereby providing notification of the selection of Selective Catalytic Reduction (SCR) for NOx control and Seawater Wet Gas Scrubber System (WGS) option in the Consent Decree. This document presents the Design Specifications for the SCR and WGS to be installed at Birla Carbon's carbon black production facility in Franklin, LA (denoted in this document as the "North Bend" plant). In accordance with the provisions of the Consent Decree, the Selective Catalytic Reduction System (SCR) is designed to control emissions of Nitrogen Oxides (NO_x) from the North Bend Plant Process Systems. The Seawater Wet Gas Scrubber is designed to control emissions of Sulfur Dioxide (SO_2) from the North Bend Plant Process Systems to the limits specified in the aforementioned Consent Decree.

In accordance with the Consent Decree, the SCR will use two catalytic reactors, one reactor for each tail gas incinerator train. SO_2 emissions will be controlled by the use of a single Seawater Wet Gas Scrubber.

Birla Carbon has compiled the necessary process data that will allow for the final design and performance requirements for the SCR and Seawater WGS. These specifications are intended to ensure that the designed control efficiency of the Selective Catalytic Reduction System is consistent with the NO_x Process Systems Operation Emissions Limits, and that the designed control efficiency of the Seawater Wet Gas Scrubber is consistent with the SO_2 Process Systems Operation Emissions Limits and Control Technology requirements established in the Consent Decree for the North Bend plant. This document provides a description of the existing Process Systems at the North Bend Plant, an explanation of the design basis for the Selective Catalytic Reduction System, Seawater Wet Gas Scrubber and identification of the design specifications. This document also includes a generalized Process Flow Schematic for the proposed emissions control systems installation.

The current information constitutes only the preliminary design of the Selective Catalytic Reduction System and Seawater Wet Gas Scrubber; the information provided in this Design Specification does not reflect the final design for the system which will be installed. As such, the information in this document reflects currently available information, including preliminary data from selected suppliers of the equipment, and is subject to change.

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2.0 EXISTING PROCESS SYSTEMS

Birla Carbon manufactures various carbon black products at the North Bend facility, using several different oil feedstock, or blends of oil feedstock, as the primary raw material.

During carbon black production, oil feedstock is atomized and injected with preheated air into a reactor. The oil feedstock is further vaporized and undergoes partial combustion in a sub-stoichiometric (oxygen-deficient), environment in the reactor. The feedstock remaining after combustion of the available oxygen completes a de-hydrogenation phase, followed by a phase in which carbon black nuclei are formed. These nuclei coalesce and grow into the primary carbon black aggregates which define the product. The reaction is stopped in the reactor by quenching with water. The various colloidal and surface chemistry properties of the carbon black are controlled by varying the feedstock composition, the temperature within the reactor, the oil to oxygen stoichiometry, and the carbon black reactor quench time.

Post reactor, the carbon black is conveyed along with the combustion process gas (Tail Gas). In addition to the carbon black aggregates, the tail gas stream contains carbon monoxide (CO), hydrogen (H_2), organic sulfides, water vapor, and other unreacted byproducts from the process. The carbon black and tail gas mixture is cooled via a heat exchanger and further water quenching, the carbon black is separated from the tail gas using a fabric filter (Main Bag Collector). The separated carbon black is further processed according to customer specifications, stored and shipped from the facility. The tail gas, which has calorific value, is either used as a fuel for process heating in the dryers or combusted in incinerators, one of which is equipped with a boiler used to generate steam for the co-generation of electricity. The combusted flue gas from the dryers currently is exhausted through existing exhaust stacks. The remaining tail gas that is not consumed by the dryers, is collected in a common header and directed to the two existing tail gas incinerators, where the Tail Gas is burned to destroy hazardous air pollutants. Incinerator #1 exhaust temperature is controlled with a water quench system to protect downstream equipment and is exhausted through the plant's main stack. Incinerator #2's Flue Gas exhaust is routed to an existing Heat Recovery Steam Generator (HRSG), where recovered heat is used to power a steam turbine, the Flue Gas is then exhausted through the plant's main stack.

3.0 DESIGN BASIS FOR EMISSIONS CONTROL SYSTEMS

The Selective Catalytic Reduction System will be designed to treat all of the tail gas generated from the carbon black units at the Birla Carbon North Bend facility. Tail gas from the reactors is gathered in a common header and distributed to the two incinerator trains, designed in parallel. The reason for two parallel incinerator trains is:

1) The System provides redundancy to keep the plant operational during routine maintenance activities.

2) The System provides greater turndown capability and combustion stability, allowing the plant to maintain its current flexibility of operations and reactor

settings, while ensuring NO_x and HAPs destruction.

The total capacity of the incinerator trains is designed to process the current plant tail gas volume, in addition to additional reserve processing capacity to ensure flexibility in plant operations.

The two Selective Catalytic Reduction System trains will be composed of two similar existing incinerators, two HRSG's and two matching SCR units, for treatment of NO_x. The SCR units will be designed to treat all of the Flue gas generated by the Carbon Black production. Aqueous Ammonia will be injected prior to the SCRs to increase the efficiency of NOx reduction.

The two exhaust gas trains will be combined after the SCR's to form a single exhaust stream.

Direct Sorbent Injection will be applied in the single exhaust Train for Opacity Control and reduction of SO_3.

The single exhaust stream will be routed to the Seawater Wet Gas Scrubber for treatment of SO_2. The exhaust stream will then be exhausted through a single new stack after SO_2 treatment.

The Seawater Wet Gas Scrubber will use water from the Gulf Intracoastal Waterway (GIWW), in the SO_2 reduction process based on prior studies provided to US Environmental Protection Agency (EPA), Department of Justice (DOJ) and Louisiana Department of Environmental Quality (LDEQ), water from the GIWW is capable of removing SO_2 from the flue gas stream. The reaction process water will be circulated through an aeration basin prior to use in the WGS, and then will return to the GIWW. Sorbent Injection, for Alkalinity Control, will be added as required in the Aeration Basin.

The Continuous Emissions Monitoring System (CEMS) for monitoring environmental compliance will be located in the final exhaust stack.

Primary components of the new emissions control system include SCR, Aqueous Ammonia Injection, Dry Sorbent Injection, Seawater WGS system, new combined exhaust stack and CEMS.

The SCR System will be designed to reduce NOx emissions at the stack outlet to no more than 38 ppmvd (@ 0% O2) as a 365-day rolling average, and 54 ppmvd (@ 0% O2) ppm as a 7-day rolling average in accordance with Appendix E of the Consent Decree.

The Seawater WGS will be designed to reduce SO_2 emissions at the stack outlet to no more than 80 ppmvd (@ 0% O2) as a 365-day rolling average, and 120 ppmvd (@ 0% O2) ppm as a 7-day rolling average in accordance with Appendix E of the Consent Decree.

The SCR System and WGS will also be designed to reduce PM emissions at the stack outlet to no greater than 0.015 gr/dscf on a 3 hour average basis in accordance with Paragraph 31(b) of the Consent Decree.

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The best available information concerning the current flows and composition range of the predicted exhaust gas streams produced by the North Bend Plant Process Units are shown in Table 1. These values are based on current operating information and process calculations from the SCR System and Seawater WGS vendor. As stated above and as shown in Figure 1, the tail gas is split between Incinerator Trains #1 and #2, then rejoined after the SCR process.

TABLE 1

North Bend Plant Flue Gas Flows and Compositions

Parameter	Units	Maximum Flue Gas Flow	Normal Flue Gas Flow	Minimum Flue Gas Flow
Total Flow	Lb/hr, wet	890,000	690,000	230,000
Total Flow	SCFM	210,000	160,000	53,000
Molecular weight, wet	kg/kmol	26.5	26.6	26.7
NO_x as NO_2	Lb/hr	380	230	94
NO_x	ppmvd@0%O_2	450	350	450
SO_2	lb/hr	3300	2200	1100
SO_2	ppmvd@0%O_2	2800	2500	3700
H_2O	% vol, wet	29	29	28
CO_2	% vol, wet	6.8	6.8	6.5
N_2	% vol, wet	59	60	61
O_2	% vol, wet	3.5	3.6	3.9

4.0 DESIGN SPECIFICATIONS

Birla Carbon has contracted with an Engineering, Procurement and Construction (EPC) Contractor to prepare preliminary and final design packages, and complete construction and installation of the NOx and SO_2 emissions control systems at the North Bend location. The design is consistent with the performance standards described above. The descriptions below are general and representative of the main components; final design details will be determined based on additional engineering and analyses.

Selective Catalytic Reduction System (SCR)

An SCR with catalyst beds will be installed to meet the intended NOx emission reduction performance standard. The SCR will reduce NOx emissions to Nitrogen and water vapor. Ammonia injection and flue gas temperature control will be will be used to achieve optimal performance conditions for SCR function.

To reduce SO_3 loading and control stack opacity, a Dry Sorbent Injection system will be installed downstream of the SCRs. After reacting with the SO_3, the dry sorbent will be collected in the Seawater Flue Gas Desulfurization (SWFGD) basin.

Seawater Wet Gas Scrubber (WGS) Design Specifications

To meet the intended SO_2 emissions reduction performance standard, Birla Carbon will install a seawater wet flue gas desulfurization system. The seawater WGS system will utilize the naturally occurring alkalinity in the GIWW to convert the SO_2 in the flue gas stream into sodium sulfite that will then be discharged with the scrubber water back into the GIWW.

The WGS system will include an open spray tower absorber with an aeration basin, integral reaction tank and exhaust stack. The absorber will have a spray section, an absorber recirculation system, feed water pumps, and mist eliminators. Sorbent Injection will be used for Alkalinity control in the aeration basin.

The exhaust gas emissions will be monitored by a CEMS, located in the exhaust stack. CEMS data will be logged and reported as per the Consent Decree requirements.

A process flow schematic depicting the key components of the SCR System and Seawater WGS design for the North Bend Facility is shown in Figure 1.

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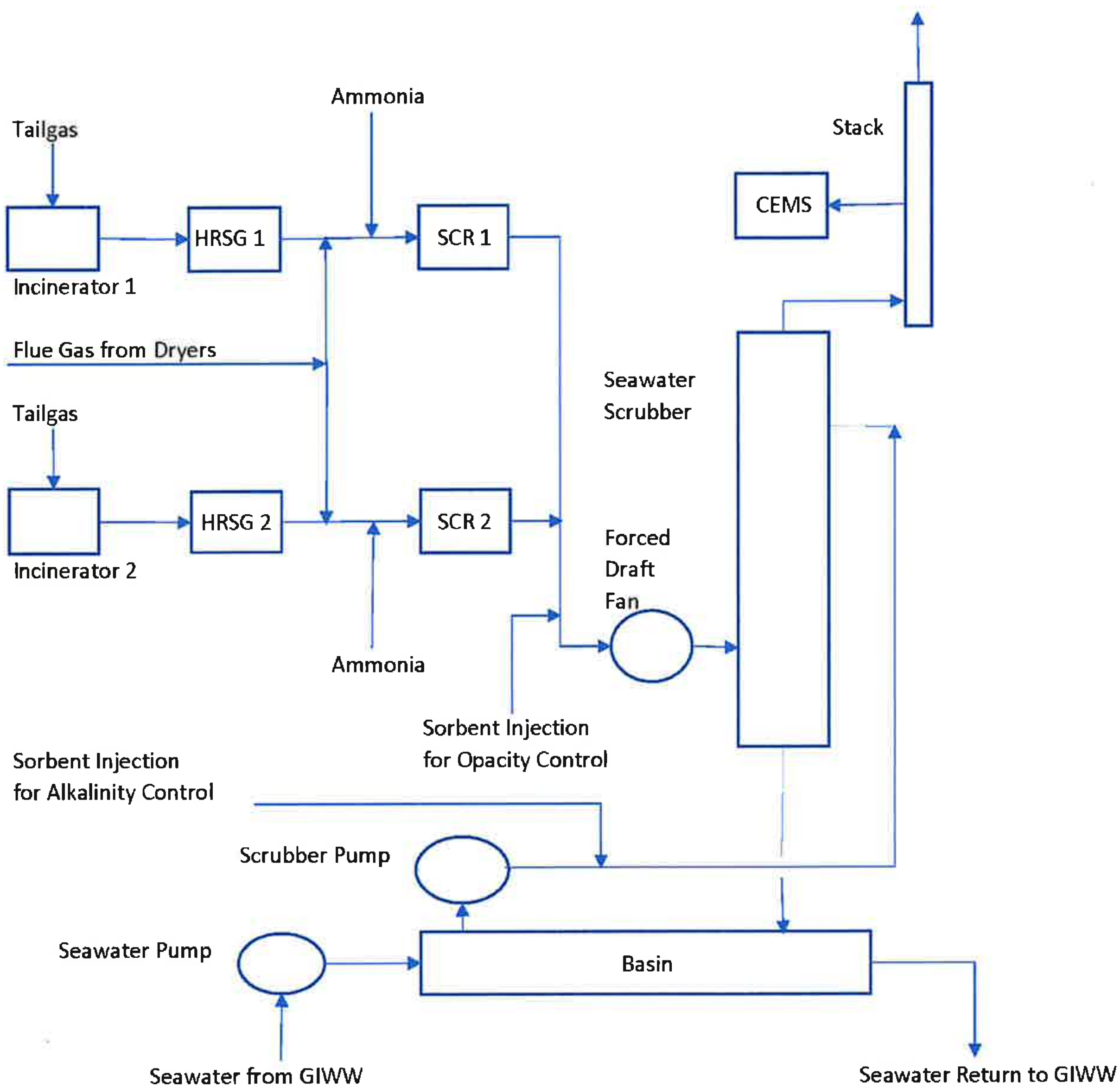

<u>Figure 1.</u>
North Bend System Schematic
NOx and SO_2 Emissions Control System

5.0 PROJECTED EMISSIONS PERFORMANCE

Table 2 summarizes the projected NOx, SO_2 and PM emissions from the new North Bend Facility stack CEMs, described in this Design Specification. As shown below, the expected performance of the systems will achieve the intended SO_2 reduction goals as required by option A in paragraph 17 of the Consent Decree. The expected performance of the systems will achieve the intended NOx reduction goals as required by paragraph 28 of the Consent Decree. Particulate emissions will be as determined by the methodology prescribed by paragraph 31 of the Consent Decree.

TABLE 2
Expected Emissions Performance

Emissions Parameter	7-Day Rolling Average	365-day Rolling Average
SO_2 (ppmvd, 0% O2)	120	80
NOx (ppmvd, 0% O2)	54	38

Emissions Parameter	3-hour Average Basis
Particulate Material (PM) (gr/dscf)	.015

6.0 CONCLUSION

The foregoing design specification for the intended SCR System and Seawater WGS at the Birla Carbon North Bend facility demonstrates that it will meet the intended NOx and SO_2 emissions control objectives identified in the Consent Decree. The information in this document is subject to change until the equipment design is finalized; however, the control objectives for the SCR System and Seawater WGS at the Birla Carbon North Bend facility identified in this design specification will be maintained through any adjustments necessary to the final design details.